



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/727,648	12/05/2003	Ichiro Yamashita	61352-059	8956
7590 01/26/2006 MCDERMOTT, WILL & EMERY 600 13th Street, NW Washington, DC 20005-3096			EXAMINER KALAM, ABUL	
			ART UNIT 2814	PAPER NUMBER

DATE MAILED: 01/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/727,648

Applicant(s)

YAMASHITA, ICHIRO

Examiner

Abul Kalam

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/25/03-02/12/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3 and 5-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3 and 5-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12/05/2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 02/12/2004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Status

1. Claims 2 and 4 have been cancelled in the preliminary amendments. Claims 1, 3, and 5-17 are pending in the application.

Priority

2. Applicant's claim for the benefit under 35 U.S.C. 111(a) of pending prior International Application serial no. PCT/JP03/00637 filed on May 28, 2003 is acknowledged.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: The Method of Production of a Nanoparticle of a Compound Semiconductor in a Cavity of Protein.

4. There are typographical errors on pg. 4, 1st paragraph and page 8, 2nd paragraph: "filed" should be "fields" and "Ce" should be "Se."

Applicant's cooperation is requested in correcting these and any other errors of which the applicant may become aware of in the specification.

Claim Objections

5. Claims 1, 3, and 5-17 are objected to because of the following informalities:

In line 6 of claim 1, the phrase "in a solution" is unclear because there is already a solution claimed in line 3 of the claim. Is this "solution" another solution or is this the same solution claimed in line 3? The office will interpret "a solution" in line 6 as the same solution claimed in line 3 of claim 1. Claims 3 and 5-17 depend on claim 1, and thus also contain the same error. Appropriate correction is required.

In line 8 of claim 1, "group II element" should be changed to "group II element ion," to provide antecedent basis.

In line 2 of claims 5, 6, and 7, the phrases "a complex ion" and "a central metal" are unclear because there is already a complex ion and a central metal claimed in lines 8 and 9 of claim 1. The office will interpret the complex ion and the central metal in claims 5, 6, and 7 as the same complex ion and central metal claimed in claim 1. Appropriate correction is required.

6. Claims 1, 3, and 5-17 are objected to because of a lack of antecedent basis: Claim 1 recites the limitation "the production of a nanoparticle" in line 1. There is insufficient antecedent basis for this limitation in the claim. Claims 3 and 5-17 depend on claim 1, and thus also contain the same error. Also, in claims 1-16 "method of the production" should be changed to "method of production."

Claim 16 recites the limitation "the production step" in line 2. There is insufficient antecedent basis for this limitation in the claim. Claim 17 depends on claim 16, and thus also contains the same error. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 5, 11-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Wong et al. (*Biomimetic Synthesis of Cadmium Sulfide-Ferritin Nanocomposites*) (Applicant's IDS).

With respect to claim 1, Wong teaches a method of production of a nanoparticle which comprises:

a step of forming a nanoparticle of a compound semiconductor in a cavity part of a protein (fig. 1), in a solution containing the protein having the cavity part therein and an ion (Cd^{II}) of an element to be a material of the compound semiconductor (pg. 929, par. 1);

wherein said method comprises a step of forming a nanoparticle of a group II-group VI compound semiconductor (fig. 1, CdS) in the cavity part of the protein (fig. 1, apoferritin), in a solution containing the protein, a group II element ion (fig. 1, Cd^{II}), and a group VI element ion (HS^-).

wherein said solution contains a complex ion (Cd^{II} acetate) having the group II element (Cd^{II}) as a central metal (pg. 931, par. 4).

With respect to claim 5, Wong teaches wherein a complex ion (Cd^{II} acetate) having the group II element ion (Cd^{II}) as a central metal is included in the cavity part of said protein (apo-ferritin, pg. 931, par. 4).

With respect to claim 11, Wong teaches wherein group II element is cadmium (Cd) and group VI element is sulfur (S) (pg. 929, par. 1).

With respect to claim 12, Wong teaches wherein the nanoparticle is formed from the compound semiconductor CdS (pg. 929, par. 1).

With respect to claim 13, Wong teaches wherein the protein is apo-ferritin (pg. 931, par. 3).

Claim Rejections - 35 USC § 102(b)/103(a)

8. Claims 15-17 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Wong.

With respect to claim 15, Wong teaches a nanoparticle (pg. 929, par. 1) produced by the method of production according to claim 1.

With respect to claim 16, Wong teaches a complex comprising a nanoparticle and a protein (fig. 1).

With respect to claim 17, Wong teaches the complex wherein the protein has a part, which specifically binds to a particular protein (pg. 928-929, par. 3).

Initially, and with respect to claims 15-17, note a "product by process" claim is directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324, 326 (CCPA 1974); *In re Marosi*

Art Unit: 2814

et al., and particularly *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product “gleaned” from the process steps, which must be determined in a “product by process” claim, and not the patentability of the process. Moreover, an old and obvious product produced by a new method is not a patentable product, whether claimed in “product by process” claims or not. As stated in *Thorpe*,

even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972); *In re Pilkington*, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935);

As to the grounds of rejection under section 103(a), the method for production of a nanoparticle could have been formed using other structures such as lipids, instead of proteins, for the cage structure of the nanoparticle. See also MPEP 2113 which discusses the handling of “product by process” claims and recommends the alternative (102 / 103) grounds of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 3 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong as applied to claim 1 above, and further in view of Monzyk (US 5,304,382).

With respect to claim 3, Wong teaches a method of forming a nanoparticle compound semiconductor as described in claim 1 above, with the exception of explicitly disclosing: Wherein the solution further contains an ammonium ion.

However, Monzyk teaches a solution containing ammonium acetate in a method of production of a nanoparticle (col. 13, Ins. 44-46). It is well known in the art that ammonium acetate contains an ammonium ion.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Wong to have the solution contain an ammonium ion as taught by Monzyk, thus forming a buffer medium in order to adjust the pH value of the aqueous solution containing the protein. The pH value of the protein solution is adjusted in order to open the channel of the protein and then form the nanoparticle in the cavity of the protein.

With respect to claim 14, Monzyk teaches wherein the method further comprises a step of eliminating the protein by a heat treatment after forming the nanoparticle.

10. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong and Monzyk ('382) as applied to claims 1 and 3 above, and further in view of Bruchez et al. (US 2002/0155507).

With respect to claim 6, Wong and Monzyk teach a method of production of a nanoparticle as applied to claim 1 above, including a complex ion (Cd^{II} acetate) having said group II element ion as a central metal.

Thus, Wong and Monzyk are shown to teach all the features of the claim with the exception of explicitly disclosing: a complex ion having ammonia as a ligand in the solution.

However, Bruchez teaches semiconductor nanocrystals produced in a protein (fig. 4) having ammonia as a ligand (amine) in the solution (pg. 21, [0201]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Wong and Monzyk, to include a complex ion having ammonia as a ligand in the solution, in order to adjust the level of pH of the solution, while at the same time supplying semiconductor metal to the cavity of the protein.

With respect to claim 7, Wong teaches the complex ion having said group II element ion as central metal (fig. 1) is in the cavity part of the protein and Bruchez teaches a complex ion having ammonia as a ligand is present in the cavity of protein (fig. 4, pg. 21, [0201]).

11. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong as applied to claim 1 above, and further in view of Mirkin et al. (US 2003/0129608).

With respect to claim 8, Wong teaches a method of forming a nanoparticle compound semiconductor as described in claim 1 above, with the exception of explicitly disclosing: Wherein the supply of said group VI element ion (X^{2-}) into said solution is conducted by adding H_2NCXNH_2 .

However, Mirkin teaches the addition selenourea ($\text{H}_2\text{NCSeNH}_2$) or thiourea (H_2NCSNH_2) to a solution in order to provide a supply of group VI element ion (pg. 9, [0093]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method of Wong to add selenourea or thiourea to a solution as taught by Mirkin, thus providing a supply of group VI element ion to the semiconductor nanoparticle.

With respect to claims 9 and 10, Mirkin teaches wherein the X is Se (selenourea) and where the X is S (thiourea).


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Abul Kalam whose telephone number is 571-272-8346. The examiner can normally be reached on Monday - Friday, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AK
January 23, 2006



HOAI PHAM
PRIMARY EXAMINER